



COLONY AND PROTECTORATE OF NIGERIA

REPORT
ON THE
Agricultural Department
FOR THE YEAR
1933

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Annual Report on the Agricultural Department, Nigeria, 1933.

INTRODUCTORY.

The length of my report has been increasing year by year. I have, therefore, endeavoured to shorten it this year by presenting as much of the information as possible in the form of simple tables of figures. But in addition to this, it has also proved necessary, in the interests of brevity, to postpone to another year, any mention whatever of excellent work being done by officers of the Department on several important subjects.

2. With a vote so reduced as ours has been by the successive cuts of recent years, 1933 was no time for the initiation of any new projects. But, in spite of all financial difficulties, steady progress has been made towards each of the four or five main objects of extension work. It is progress of which the pace has been determined by the means at our disposal; but in no important extension activity has work as yet had to be suspended entirely. At the beginning of the year, it seemed likely that we should have definitely to give up some major lines of work, or to withdraw our activities from some considerable and important areas of the country, in order to maintain efficiently whatever might be continued. It seemed clearly wiser to do that rather than to try ineffectively to continue everything everywhere. The proposition was therefore laid before each of several Native Administrations that we must withdraw from its territory unless it could relieve the department of much of the expenditure on the work in that particular area, especially that on " Other Charges " and on the salaries of the more junior African staff. In each instance the Native Administration preferred to accept the financial burden rather than to lose the services of the European and senior African staff, which are paid for by Government, and to see our work closed down. But for this broad-minded and progressive action by these several Native Administrations it would have been quite impossible for us to have made the progress that is recorded hereafter in this report. It appears that it will be only by extensions of the same system that we may hope to provide for any further extensions of agricultural activities in the near future.

LOCUST DESTRUCTION.

3. It was explained in last year's report that the Administrative Department had taken over the entire responsibility for the locust destruction campaign. As anticipated in that report, there has been a greatly reduced infestation during 1933. The relatively few bands of hoppers that have occurred have been dealt with, and there are apparently hardly more than half a score of swarms of locusts in Nigeria at the moment of writing (March, 1934). Any damage done to crops in 1933 was negligible. Price of foodstuffs in all districts are even a little lower than last year. There is every reason to suppose that the present locust infestation is nearing its end.

LOCUST RESEARCH WORK.

4. This work in Chad has been continued. Mr. Lean, who retired last year, has been replaced, solely in order that this work might be carried on continuously. The filling of any vacancy in any

technical department in Nigeria is rather a notable event in these days. It is justified in this instance not only by the importance of the subject to Nigeria, but also because Nigeria owes it to the rest of Africa, British and foreign, to study thoroughly the possible locust reservations within its borders. Other countries in Africa seem now to have recognised the obligation that lies upon them to take their share in this campaign, and so far as I can gather most of the likely reservations in Africa are being studied more or less; even if not always with the continuity and thoroughness of our work in British Chad.

5 Substantially every part of the British shores of Lake Chad has now been visited by one of the Entomologists of the Department. Detailed observation of the migratory locust, *Locusta migratoria nigratorioides*, R. & F., and the red locust, *Nomadacris septemfasciata*, Serv., has been carried out in one selected area (Kalkala, a village at the south-western corner of the lake) with practical continuity since 21st December, 1932, and is being continued.

The principal deductions drawn so far are :—

(a) The British shores of Lake Chad are almost certainly not a reservation of the migratory locust. This conclusion is still, inevitably, not quite certain. If it should prove to be wrong, then there is every reason to believe that, in British Chad, the habitat occupied by the solitary phase of this species in the periods between swarming is not extensive. Therefore, it should be possible to keep the permanent population in check by occasional poisoning, and so to prevent any transition to the gregarious phase.

(b) The red locust is permanently numerous in the southern part of British Chad. Recently it had appeared to be in the transitional condition approaching the gregarious phase. This year's observation, however, suggests that this has been checked, or else the reverse process is now in progress.

(c) So far as can be seen at present, there is no reason why swarms of the red locust should not arise from the Chad area from time to time. But, on the other hand, the early records of adult swarms and hopper bands of this species during the present infestation of Central, East and South Africa suggest that the swarming did not, in fact, originate in Chad. At present, therefore, whether swarms of *Nomadacris* have ever arisen from Chad in the past or may ever arise in the future, is still an open question.

(d) In case the red locust should need to be controlled in Chad, the observations on its habitats and habits there suggest that it would be possible to prevent the transition to the gregarious phase by means of an intensive poisoning campaign.

(e) Both sub-species of the tree locust, *Anacridium moestum*, Serv., exist permanently in British Chad, but there is no evidence that either ever reaches important numbers there.

(f) The desert locust, *Schistocerca gregalis*, Forsk., occurs only casually and occasionally in British Chad as it does elsewhere in the extreme north of Nigeria; for the political boundary roughly coincides with the southern limit of the conditions congenial to this species.

AMERICAN COTTON IN THE NORTHERN PROVINCES.

6. With foodstuffs and groundnuts at low prices at the beginning of the year, farmers naturally planted more American cotton than they had done for some years past. The quantity of seed distributed was roughly fifty per cent more than in 1932. It is

remarkable that the farmers did not change over to cotton growing to an even greater extent than they did. In spite of the fact that the weather of 1933 was unfortunately unfavourable for cotton and not unfavourable for other crops, yet cotton was by far the most profitable crop this year; and there must be many who wish that they had planted more of their land with cotton. The weather in the "export belt" was unfavourable, partly because the rainfall in July, August, September, when it is always more than adequate, was exceptionally heavy, but chiefly because only a fraction of an inch of rain (in some places none at all) fell in October, instead of the two, three, or four inches in that month which make so much difference to cotton. These factors caused an exceptionally low yield per acre, with the result that the total amount purchased for export in 1933-34, was almost exactly the same as last year, in spite of a very considerable increase in the planted area. The following table gives details for the last ten years:—

PURCHASES OF AMERICAN SEED COTTON FOR EXPORTS EXPRESSED AS
BALES OF LINT EACH 400 LB. NETT.

	Seed distributed.	Cotton Bought. Bales.	Price paid per lb. of seed-cotton.
	Tons.		
1923-24	1,810	15,683	4d.-3d.
1924-25	2,656	27,996	3d.
1925-26	2,990	37,356	2½d.
1926-27	3,372	16,659	1⅛d.-1¾d.
1927-28	2,220	16,316	2⅜d.-2¼d.
1928-29	2,640	24,686	2¼d.-2⅛d.
1929-30	3,173	34,389	1·6d.-1·2d.
1930-31	2,719	13,849	·5d.-·8d.
1931-32	1,569	4,811	·6d.-·8d.
1932-33	1,674	22,228	·8d., ·9d., ·8d.
1933-34	2,376	22,000 *	·8d.-1·2d.
1934-35	4,000 *	...	...

* Estimates subject to slight correction later.

7. Field comparisons of "L" strain with ordinary mass selected seed were carried out on all of the farms under our control, including the various Native Administration farm centres. The results confirm those of previous trials. At Zaria, and on similar soils, the "L" strain gave a yield slightly superior to that of the ordinary seed on fields that were in relatively good heart, but it also proved definitely inferior on unmanured exhausted soil, even of the heavier type. On light soils, as that of Kano, the new strain is inferior to the old Kl strain (evolved on and for that light soil) to a degree that cannot possibly be disregarded. It is clear that the new strain cannot be distributed in the districts of light soil; but the question whether to continue its extension on the heavier soils of

Zaria and Southern Katsina is a difficult one. The farmers at Dan Ja, to whom the "L" seed from Daudawa farm was distributed in 1933 have expressed themselves as very well satisfied with it. This, however, really helps us very little; for it is only a very gross difference in yield between two strains of cotton that can be judged by eye, even when they are grown side by side in alternating plots. Moreover, the soil at Dan Ja is good and, in many instances, manured, so that it suits the new strain. It is far from satisfactory to replace an existing type of cotton by a new one which is known to give an inferior yield, even though it be only in special circumstances. It is, of course, impracticable in Nigeria to recommend two strains of cotton for different classes of soil in one and the same district. On the whole, so far as can be judged, the gross relative gain that should be secured from the new strain by those farmers who grow the new cotton on good land should exceed the total loss incurred by those who grow it on the poor land. It has therefore been decided to continue to extend the growth of the new strain in the districts where heavy soil predominates. We still hope, however, that the plant breeders may be able eventually to produce a cotton of equally good quality as the "L" strain and of greater hardiness.

GINGER EXPORT EXTENSION WORK.

8. Steady progress has again been made in the extension of the production of peeled, sun-bleached ginger for export (*see* paragraph 12 of last year's report, page 5). The amounts that have been bought for export annually since 1931, when this matter was first taken up by the Department, have been as follows:—

1930-31	... 15 tons.	1932-33	... 53 tons.
1931-32	... 39 tons.	1933-34	... 86 tons.

9. As in previous years, the ginger was all graded by an officer of the Department at markets held at special fixed places and dates: this year eight markets were held in all, distributed between three different places. The prices paid were again sharply differentiated according to the quality of the produce as follows:—

<i>Grade.</i>	<i>1932-33.</i>	<i>1933-34.</i>
	d.	d.
1	3 $\frac{5}{8}$	4
2	3 $\frac{1}{8}$	3 $\frac{1}{2}$
3	2 $\frac{5}{8}$	2 $\frac{5}{8}$
4	1 $\frac{1}{2}$	1 $\frac{1}{2}$

As in previous years, practically the whole of the crop was of third grade. Only a few hundredweights of fourth grade were bought from the growers in certain new producing areas, in order to avoid disappointing those who had genuinely tried to prepare their ginger properly but had failed through inexperience. Only two tons or so was prepared up to the standard demanded for grade 2. It is difficult to understand why so little of the ginger should be of the superior grades. The difference between the first three grades is in the plumpness of the roots. To obtain the necessary size, it seems, from our experiments, only to be necessary to plant in really suitable soil and to weed the land with the hoe instead of merely pulling the weeds by hand. The preparation of the ginger, which involves a somewhat considerable amount of care and trouble, is now very satisfactory, which makes it seem the more remarkable that improvement in the plumpness of the roots cannot be achieved yet.

MIXED FARMING EXTENSION WORK.

10. The meaning in which the term "mixed farming" is used in this Department has been explained in previous reports. The following figures show the progress made in the introduction of this revolutionary improvement:—

	No. at end of previous season.	No. starting first time.	Failures* during the season.	No. continuing at the end of the season.
1928. Total	Nil	3	Nil	3
1929. "	3	9	5	7
1930. "	7	13	3	17
1931. "	17	31	4	44
1932. "	44	71	7	108
1933. Zaria Emirate...	66	38	3	101
Kano Province	23	5	13	15
Katsina Emirate	17	20	1	36
Sokoto Province	2	21	2	21
1933. Total	108	84	19	173

* "Failures" include all men who give up the system for any cause, including even death, when the heir is not capable or willing to continue the system.

11. The following data about the social positions of the farmers may be of interest:—

	N. A. Executive Officials.	Village Heads.	Peasant Farmers.	Others.	Total.
Zaria Emirate	12	17	63	9	101
Katsina Emirate	15	10	11	...	36
Sokoto Emirate	17	...	2	1	20
Gwandu Emirate	1	...	...	...	1
Kano Province	13	...	2	...	15
Total	58	27	78	10	173

There would be little error in classing most of the village heads with the ordinary private peasant farmers. The position of most of them in their village is that of *primus inter pares*; their salary is small, and, as a rule, which is not without exception, their general outlook and sympathies are much nearer to those of the peasants under them than of the officials over them. The "others" include such persons as several Alkalis, a retired district head, a shop-keeper, a contractor; they are mostly, if not invariably, men with no other interest in the matter except making a profit. Some of the executive officials too, are real and keen farmers; but some of them are doing this work merely because it is "the correct thing." Altogether, it may be estimated that genuine, enthusiastic volunteers constitute over three-quarters of the whole number.

12. The hire purchase system has worked satisfactorily, except perhaps in one respect. In the Soba district near Maigana in Zaria Province many (though not all) of those advance-holders who have completed their second season said that they could not pay their instalments, although last season the same men had paid their

first instalments readily, and the new men who are now in their first year are also paying their first instalments fairly well. The actual figures this year are as follows :—

	Amount due.			Paid by March 31st.		
	£	s.	d.	£	s.	d.
Hiring charges	16	13	9	14	16	8
Capital 1st instalment ...	39	6	0	31	6	0
„ 2nd instalment	76	0	0	33	0	9

13. In view of the terribly low prices of produce this year, and of the attitude of the farmers, it seemed possible that the slow recovery of the money due this year might be really ascribable to the farmers' absolute lack of the wherewithal to make the heavy repayments which, under the scheme suggested by the Department, are demanded in the second year. Detailed investigation was therefore made of the circumstances of a dozen of those who stated that they were unable to repay in full. The investigation showed that their returns this year were extremely small. The average gross return per acre this year from field crops was only about eight shillings per acre in Soba district. This result of the investigation of the farmers' returns is confirmed by returns from our demonstration farms on similar land. The latter are about ten shillings per acre, but then the crops on those farms are above average. The mixed farmer in his second year has generally six and half or seven acres of crop, and his gross return from the farm thus only amounts to something like £2 10s. 0d. or £2 15s. 0d.

14. Now the scale of repayment of an advance of £5, which is the normal amount of an advance in this district, as suggested by this Department to the Native Administration, was :—

	Capital repayment.			Hiring charges.	Total.
1st year	15/-			5/-	£1
2nd year	40/-			about 4/6d.	about £2 4 6
3rd year	45/-			about 2/6d.	about £2 7 6
In all	£5			about 12/-	about £5 12 6

Thus the “ average man ”, out of a gross income of about £2 10s. 0d., has to pay his tax, feed and clothe himself and family, and then is asked to repay £2 4s. 0d.! It is true that some of the men earn a few shillings from other sources than their farm, perhaps five shillings or seven shillings. But also, roughly, half the men are worse off than the “ average man ”.

15. Three points seem to stand out :—

(1) The farmers really cannot be asked, even in more normal times, to repay, in the second year, so large a proportion of the capital as we had suggested.

(2) This year, most of the men concerned must quite genuinely have done their best and repaid all they possibly could. Most of them must have paid back into this scheme every penny they earned in the year. The amounts repaid (as tabulated above) are a real testimony to the integrity of the peasant as well as to the soundness of the scheme.

(3) With the low price of grain and groundnuts and the low yield per acre of cotton, 1933-34 has been a very exceptionally bad season, financially, for the farmer. More than ever before he has a full granary and an empty pocket. Whatever sum of money was the right amount to ask a farmer to repay in a normal year, is *ipso facto* too much to demand in such a year as the present. If it were not too high this year, then it would be too low in a normal year.

16. We have suggested to the Native Administration that the scheme should be modified so as to allow four years for repayment of the capital, divided as follows:—fifteen per cent; twenty-five per cent; thirty-five per cent; twenty-five per cent. It is possible that the amounts for the third and fourth years may yet have to be interchanged. And in years like the present, when farmers are extraordinarily short of money, some remission will be necessary to the less successful men, even out of the amount due under the revised scale.

FARMERS' CATTLE AND TRYPANOSOMIASIS.

17. The encouragement given by the Zaria Native Administration to the clearing of the bush along streams near villages has resulted in a real reduction in the incidence of trypanosomiasis in the cattle in the areas where the campaign has been conducted. The co-operation and active assistance of the Zaria Native Administration in this matter, as in all other aspects of our work, is very highly appreciated.

18. It seems clear that a considerable proportion of the cattle belonging to the nomad Fulani is infected with trypanosomes. But we have found by experience that if farmers' cattle are properly fed and are worked reasonably, they will show no symptoms of the disease, even though there is good reason to believe that they are infected with it. It seems likely that most of our losses in the past have been due to the fact that we have not paid enough attention to the maintenance of the resistance of our cattle to this disease. We have previously purchased most of the new cattle, both for our own farms and for new farmers, during the latter part of the dry weather, so as to have them trained ready for the next farming season, without having to maintain them unnecessarily long before they start work. That meant that we bought the cattle at a time when grazing is poor and other foods scarce, so that cattle are not at their best. As soon as they were purchased, they were sent to a veterinary camp for inoculation against rinderpest, pleuro-pneumonia and sometimes also blackquarter. These inoculations are in themselves sufficient to break down the resistance to trypanosomiasis of any but the strongest animals. As soon as the cattle were partially recovered from the inoculations, we used to break them in to work and hand them over to the farmer. He naturally proceeded immediately to work them hard as soon as the rains came, before they had a chance to regain condition. In such circumstances, if any animal was infected at all, its resistance was almost certain to break down. In future, we shall try to buy cattle during the rains, and to have them inoculated while grazing is good and they are at their best. Then, with good feeding during the dry season, they should be in good condition when the rains come and they start heavy work. The action of the Chief Veterinary Officer in allowing his officers to teach Superintendents of Agriculture the proper way to give injections is highly appreciated, for such injections, if given in the very early stage of an attack of the disease, are very beneficial indeed; and several animals, which otherwise would have died, were saved last year, only because the Superintendent of Agriculture was able to treat them on the spot as soon as the first symptoms appeared.

19. Lest a false impression should be given by this discussion of the subject, it is necessary to explain that the proportion of loss during the time between purchasing cattle and handing them to the farmers, has been less than five per cent of the whole number of cattle handled. A few losses have occurred within a week or so of the handing over of the cattle to farmers, but very few after that.

CATTLE BREEDING AND CALF MORTALITY.

20. As has been mentioned in the previous reports, the objective in the cattle breeding at Samaru, Shika, and Kano is to improve the milking and frequency of calving of the cows, and at the same time to maintain types of cows which will produce useful working bullocks. This is necessarily slow work and it is as yet too early to say more than that it is progressing, and that there is every prospect of success.

21. The worst difficulty that has been encountered so far is frequent deaths of calves. Although it is known that the Fulani cattle owners in this country also experience very heavy mortality among their calves, as heavy or heavier than we do, yet it is probable that most of our difficulties would be avoided if, instead of feeding the calves from the bucket, we allowed them to suckle their dams. We are loath, however, to do this if it can be helped; for it is impossible to have really accurate milk records if the calves suckle.

22. The Veterinary Department have given us much assistance in tackling this problem. It is evident that the high mortality was not due merely to one factor; and similarly many different measures have each played a part in the improvement which has been achieved recently both at Samaru and Shika. Drenching with a vermifuge of copper sulphate solution and mustard was one important factor; warmer housing was another; and many antiseptic precautions that were taken have doubtless also had an effect. The gross result of all this care is shown in the following figures of calf mortality at Shika Stock Farm:—1931, fifty-nine per cent, 1932, fifty-five per cent, 1933, twenty-eight per cent.

23. The calf mortality at Kano and Samaru has never been so serious as at Shika, and there is no doubt that the overstocking of the Shika farm—overstocking both in relation to the food available and to the accommodation in the buildings—has been one of the many factors causing the trouble. The Shuwa (Bornu) cattle at Shika have therefore all been transferred to Samaru, and the numerically small Adar herd moved to Kano, leaving only the white Fulani and Godali (Sokoto) herds at Shika. These measures, together with the culling of the worst cows (which has now been started in the Shuwa and white Fulani herds) will bring the number of cattle at Shika down to a more reasonable figure. Each of the other two farms will now have cattle of one breed and one only.

24. In view of this mortality in calves at Shika, and the calf mortality which Fulani herdsmen are believed to incur, it is of interest to consider whether the new type of mixed farmer, when he gets a cow, will have an equal proportion of losses. We believe that he will not. Indeed, so far as it is yet possible to say anything, one may say "he does not". The main cause of the Fulani's losses of calves appears to be that they are not generous enough in regard to the amount of milk they allow the calf to take. We consider that a calf should have fully 900 pounds of milk in the first seven months of its life. The Agricultural Officers in the Northern Provinces estimate that Fulani seldom allow more than 300 pounds or at most 400. Certainly many of their cows do not give as much as 900 pounds, and a calf will seldom get more milk than its dam yields. Secondary causes of deaths among the Fulani's calves must be accentuated by their practice of keeping them in the open with no shelter at all at any time.

25. The troubles at the departmental farms have been due chiefly to our practice of feeding the calf from the bucket instead of letting it suckle its dam; and secondarily to other causes all directly connected with our being the first to start calf rearing on a large scale locally, and having to learn the technique thereof.

26. The small farmer of the future—indeed, the few of the present who have cows—will have only one cow, and hence only one calf to look after at a time. Since that calf will be allowed to suckle its dam and be generously treated, the small farmer ought to avoid both the causes of loss that occur on our farms and those that the Fulani incur.

FARM CENTRES AND DEMONSTRATION FARMS.

27. The following list gives details of the Native Administration farm centres and one-man farms, for the demonstration of mixed farming, in the most northerly provinces of Kano, Zaria and Sokoto.

There are various farms belonging to Native Administrations in other provinces which are concerned with demonstrating matters other than mixed farming, and are therefore not included in this list.

FARM CENTRES (FOR MIXED FARMING.)

Province.	Emirate.	Centre at.	Opened for cropping season.	Approximate acreage.	Results and Progress.
Zaria	Katsina	Kafin Soli ...	1931	40	Excellent from every point of view. A cattle dip is now being installed. Extension work progresses rapidly.
Sokoto	Sokoto	Gusau... ..	1932	40	The farm itself has given very good results and extension work is just beginning.
Sokoto	Gwandu	Birnin Kebbi	1933	40	Very slow. Farming under local conditions needs careful study on the farm centre before we can hope to start serious extension work.
Kano	Daura	Tambu (5 miles from Daura)	1933	60 cleared 33½ cropped	Excellent. The experimental work gave most useful results and extension work is already beginning.
Kano	Kano ...	Dangora ...	1934	40 acres cleared	Only just being started.

DEMONSTRATION FARMS. (MIXED FARMING.)

Province.	Emirate.	Farm at.	Opened for cropping season.	Approximate acreage.	Results and Progress.
Zaria...	Katsina	Mallamfashi...	1932	10	Excellent. This farm is just beginning to exert a genuine influence on extension work.
" ...	"	Mani ...	1933	10	A satisfactory cropping season—extension work just starting.
" ...	Zaria ...	Saminaka ...	1933	11	Excellent. Crops good and is already making its influence felt from the extension work point of view.
" ...	" ...	Maigana ...	1931	10	Excellent. Much of our success in this area is due to the influence of this farm.
" ...	" ...	Kaduna ...	1934	10	Just being started.
" ...	B. Gwari	B. Gwari ...	1934	8'3	Just being started.
Sokoto	Sokoto	Sokoto ...	1933	15	A satisfactory cropping season—has already supplied useful information.
Kano ...	Kazaure	Kazaure ...	1932	14'3	Moderate. The labourer needed much supervision and crops were not as good as they should have been.
" ...	Gumel	" ...	1932	12	Satisfactory — a good cropping season. Progress with extension work slow.
" ...	Kano ...	Taura ...	1932	14'3	Started when the old Colony scheme was re-organised. Crops satisfactory and provide a good demonstration of mixed farming. Progress with extension work very slow.
" ...	" ...	Rano ...	1932	12'1	Moderate. Last season's crops quite good; but no progress in extension work yet.
" ...	" ...	Karaye ...	1932	15	Excellent results on the farm itself. It appears to interest the neighbouring farmers; but so far only the D.H. has actually taken up mixed farming.

28. As will be seen from the notes in the remarks column, these farms are, on the whole, serving their purpose well; and there is no doubt that they are a quite essential factor in the successful introduction of mixed farming. The typical farm centre consists of one or two small farms each of ten to fifteen acres, and each managed as an entirely self-contained unit; that is to say, each farm is worked by one labourer, who is provided with one pair of bullocks, a cow, and a separate cattle-pen; so that each farm shows what a small farmer can do. The remainder of the land at the farm-centre provides a place for the training of farmers and their boys and cattle in cultivation, and helps to feed such visiting cattle. The demonstration farms are isolated single units similar to those at the centres. Again each farm is worked by a labourer who lives upon it with his family, and whose circumstances differ from that of a farmer as little as possible; except that, as a paid labourer, he has to do exactly as he is told. The object of the demonstration farms is to provide an example and means of instruction within a few miles journey of each new mixed farmer. The capital cost of each such demonstration farm is from £10 to £15, and the annual budget about the same. The revenue in normal times would cover the greater part, at least, of the annual expenditure; and later on, when good cows can be spared for these farms, they may be fully self-supporting. The Native Administration farm at Daura, in Kano Province, is rather exceptional in that provision is made there for a certain amount of field experiments. These are necessary because we have no Government experimental farm in similar conditions to those all along our northern boundary, where the soil is exceedingly light and the climate very dry.

LIFT IRRIGATION.

29. In the dry weather of 1932-33 the Department began to demonstrate the use of bullocks for lifting water from wells and small streams for irrigation. The lift employed is the self-emptying leather bag, which is widely used in Northern Africa and Western India, and called "Sundiokos" in Bombay. Our intention originally was not only to demonstrate that bullocks can be used for the purpose of lifting water from wells, but simultaneously to ascertain and demonstrate what crops it is most profitable to grow on land thus irrigated, and how they should be grown, etc. But the result of our experience shows that, so far as concerns irrigation from wells, the whole crux of the question is to find a well that gives water in a quantity that is worth lifting with bullocks. Up to date we have not found one single well which would do more than supply water enough to make work for one bullock for a couple of hours a day. This, of course, is nothing more than playing at irrigation. However, even with the petty areas thus irrigated, we have already had enough experience to be able to state that there is no question whatever that the water can be more profitably employed for the growth of vegetables—onions, tomatoes, spinach—for which there is a wide demand. Already one man has bought and worked a bag this dry season (1933-34), and seems satisfied with his venture, while one or two others are contemplating doing so next year. If a man has a pair of bullocks it is doubtless worth his while to use them for this purpose, if there is any water in his well to spare for irrigation at all. But it is clear that what is wanted is better wells. At present the ordinary wells are all unlined, and even if the people could, without pumps, sink them far enough below water level to get a reasonably increased head, and hence greater supply, the final result would only be that the well would cave in. The few lined wells with which we have experimented seem to have insufficient

head of water to give a good flow. We are hoping to be able to co-operate with the well boring section of the Geological Survey in this matter. One difficulty that is foreseen is that of the provision of the well on some really business-like footing. At present drinking-water wells are apparently being provided as public amenities at the expense of the general taxpayer. If they are to be provided for the purpose of irrigation, which should be a matter of business, it is essential that each well must be the property of one individual or of a syndicate of a very few persons; and there must be no question whatever of a few favoured individuals getting "something for nothing", at the expense of the general taxpayer. It must be clear, before the well is sunk, that, if it yields the promised supply, then, by some scheme, sooner or later, the owner must pay for his well in full. Real, sound progress will never come from the provision of wells for irrigation by philanthropy. The first step seems to be for us to obtain some good lined wells on our own farms to ascertain and demonstrate how much profit can be made from a good well if the water is lifted by cattle. Meanwhile, there are opportunities here and there for the employment of the bullock lift in place of the balance-beam for lifting water from small streams, especially where the lift is too great for the beam.

WORK IN KANO PROVINCE.

30. As explained in last year's report there are three zones in Kano, each with its own distinctive agriculture and economies, and hence each with its own special problems for this department. These zones are: first, that comprised by the four small Northern Emirates, a country of very light soil and dry climate; secondly, the very densely populated area surrounding Kano City for a distance of twenty or twenty-five miles in every direction, which may perhaps be called the Kano suburban farms; and, lastly, the third zone is comprised by the districts adjoining the Zaria Province, to which they are mostly very similar. More knowledge than we have as yet about farming in the Northern Emirates is greatly to be desired, but there is no reason why we should not proceed immediately with extension work there. Similarly in the southern zone, there are no serious technical problems. This however cannot yet be said quite to be the case as regards the very densely populated belt around the city, where all the land is cultivated every year and the typical farm is only about two acres in extent.

31. Each of the Kano suburban farms has its goats and sometimes also some sheep and a donkey. It is very nearly true to say that every field is manured to some extent every year. Where land is so scarce and valuable it is to be expected that the most profitable system of farming will be that which gives the maximum gross out-turn per acre. Yet it is only within a mile or so of Kano City, and within a few hundred yards of smaller towns, that the yields of the crops are really heavy. All the other farms need much more manure: the stock of goats, sheep, etc., on the farm itself is evidently inadequate for the production of maximum crops. No observer can fail to be struck by the immense superiority, as compared to the remainder of the district, of the crops within a mile or so of the city. Those fields, unto which town sweepings are carried, are manured much more heavily than the ordinary farms elsewhere. The complete dependence of the crops on this soil upon manuring, or at all events their relatively very great response to manuring, may be illustrated by the following figures, selected from among many other similar results obtained at the farm.

32. In 1932, which was the third year of an experiment in which various crops were grown in rotation, the crops was guinea-corn and the results were as follows :—

Average yield on 9 plots unmanured	...	...	1,290 lb. dry grain p.a.
„ difference on 2 plots with 1 ton farm-			
yard manure p.a.	...	...	+125 „ „ „ „
„ difference on 2 plots with 2 ton farm-			
yard manure p.a.	...	...	+419 „ „ „ „
„ difference on 2 plots with 3 ton farm-			
yard manure p.a.	..	...	+664 „ „ „ „
„ difference on 2 plots with 4 ton farm-			
yard manure p.a.	...	...	+708 „ „ „ „

Thus, even on land in relatively very good heart (for 1,290 lb. dry guinea-corn grain per acre is itself a high yield), a dressing of three tons of farmyard manure per acre increased the gross yield by over fifty per cent. When guinea-corn is grown, not in rotation, but year after year on the same land, as is the common practice on these suburban farms, then the effect of manure may be still greater. For instance, the “permanent guinea-corn” manuring demonstration at Kano was only in its third year in 1933. The six unmanured plots then yielded an average of 670 lb. of dry, threshed grain per acre, while the five alternate plots, manured annually with three tons of farmyard manure gave an increase in yield of no less than 714 ± 39 pounds, that is, an increase of over 100 per cent.

33. When the effect of manure is relatively so great, while, at the same time, most farmers’ crops are far below the maximum owing to lack of enough manure, it is clearly within the bounds of possibility, however paradoxical it may seem, that the way to make the land feed two men where it fed one before, is to make it first feed one cow where it fed none before! We have tried to test the truth of this theory, by establishing two small farms, one of two and half acres and one of two acres, on our experimental farm at Kano, each resembling a small native farm as accurately as possible, but managed by a married labourer, so that we can keep accurate books of the working of the farm as a unit.

34. It is not easy to conduct an experiment of this kind with simultaneously complete theoretical rectitude and satisfactory practical accuracy. We hope to make the accounts more theoretically correct next year; but last year’s figures are substantially accurate, in spite of many of the petty items on both sides of the balance sheet being only estimated. The following figures refer to the two and half acre farm. At the beginning of the year the land received the manure made by the one cow and the goats, with ample bedding, in the previous year.

35. The family was allowed grain for food at the rate of four and a quarter pounds per day which is considered to be enough for one man, one woman and one child. No allowance was made on the income side for the proceeds of the sale of goats’ milk, meat or skins. These products are written off as an allowance to provide, directly or by exchange, the family’s need for food other than grain—an allowance which would probably cover a better diet than such poor people can generally afford. The calculations of the returns in money are based on the very low price for produce at the end of 1933, e.g., groundnuts £2 6s. 8d. per ton; guinea-corn £1 17s. 4d. per ton; millet £2 6s. 8d. per ton. The waste products, groundnut haulms, guinea-corn leaves, etc., together with the crop on a small plot of sweet potatoes, provided just enough roughage for the cow. The yield of grain was much more than enough to feed both the family and the cow.

36. Before turning to the actual returns, it may be interesting to calculate what the net income would have been if no cow had been kept; that is, in effect, to calculate what the return would have been if the farm had been one of those near to the city wall and the farmer had been able to cart out as much town manure as would have exactly the same result as the manure made by the cow, at no cost for purchase or transport. After allowing for feeding the family, as above, and the goats, there remained for sale groundnuts (494 lb.), millet (610 lb.) and cassava (778 lb.) to the value, altogether, of £1 6s. 0d.; and, also, the various bye-products already mentioned, which were actually given to the cow, but which could have been sold for thirteen shillings, making in all a total net return (*i.e.*, after allowing for food, etc., for the family) of £1 19s. 0d. The reasons why the money return per acre in Kano is twice as much as in Zaria (*c.f.* figures in paragraph 13), is simply that, *with adequate manuring*, as in this case, very much heavier crops can be grown in Kano than in Zaria. But the proviso "*with adequate manuring*" is all important.

37. When, as was actually the case, a cow is kept on the farm, there are no bye-products for sale, and the disposable surplus of millet is reduced to 289 pounds. This, with all the groundnuts and cassava (as before), realised 19s. 6d. instead of £1 6s. 0d. Thus to feed the cow has cost thirteen shillings (the value of the bye-products) plus 6s. 6d. for grain or 19s. 6d. in all, exactly one-half of the net income from the crops, after feeding the family. In place of this sum of 19s. 6d., the farmer had 992 lb. of milk for sale. The cow was in milk at the beginning of the year, went dry at the end of August and calved again at the end of October. It yielded 616 lb. of milk in the first period, in addition to that which the calf of the previous year had (not measured); and also 276 lb. in the last two months in addition to what the second calf had (which was 305 lb.). The increase in value of the first calf while receiving milk for several months at the beginning of the year, together with a two months old calf that has received 305 lb. of milk, ought to be worth quite a large sum of money; but it is impossible to state either an exact market value, or even an accurate theoretical value of the calves in this calculation.

38. The return from cow-keeping evidently depends largely on the price obtained per pound of milk sold. The milk was, in actual fact, sold (to Europeans) at 3d. per bottle (= $1\frac{3}{4}$ lb.). And we have sold it, at Zaria, to African clerks and such at 2d. per bottle. Undiluted fresh milk is, however, not commonly bought or sold in native markets, but only butter and heavily diluted butter-milk. Thus the price in the market, when expressed in terms of pure milk, naturally varies according to the butter content of the milk and according to the extent of dilution of the butter milk. In an investigation at Kano, it was found to be 1.6d. per bottle, or just over .9d. per pound, of pure milk. In the following calculations I assume the value to be 1.5d. per bottle or .85d. per pound, figures which seem to be just on the safe side.

39. At .85d. per pound, the 992 lb. of milk which were sold would have fetched £3 10s. 3d. and the nett result of the year's operations would have been this sum plus 19s. 6d. (in all £4 9s. 9d.) plus a two months' old calf. It will be remembered that if all the crop and bye-products had been sold and no cow kept, the return would have been £1 19s. 0d., less whatever it cost to obtain manure equivalent to that made by the cow. The nett return from the cow is thus £2 10s. 9d. plus the value of the farmyard manure plus a calf. The calf has actually drunk 305 lb. of milk, worth £1 1s. 7d. It

would seem that the calf should be worth at least half the value of the milk he had drunk, say ten shillings, though it is doubtful if it could be sold for that. The value of the manure made by one adult animal can be shown to be worth rather more than ten shillings theoretically, even with produce prices as low as they are to-day. Consistently with the conditions of the district, all consideration of the labour expended is neglected throughout the investigations.

The results of the investigation may be summarised :—

	£	s.	d.
Return from all crops and bye-products, after allowing for food for family, materials for houses, etc., but not keeping a cow ...	1	19	0
Value of milk produced by cow, after feeding calves liberally	3	10	3
Cost of feeding cow (bye-product, 13/-, plus grain, 6/6d.)	0	19	6
Nett return from cow (milk, £3 10s. 3d., plus calf estimated at 10/-, plus manure worth 10/- less cost of feeding 19/6d.)	2	10	9
Return from farm with cow (grain, 19/6d., plus milk £3 10s. 3d. plus calf estimated at 10/-)	4	19	9

WORK AT EXPERIMENTAL FARMS, NORTHERN PROVINCES.

40. The experiments at the farms at Zaria and Kano continue to yield valuable results. The search has continued for a satisfactory fodder crop that can be cheaply introduced into the rotation of crops. Green gram, and mixtures of maize and this and other legumes, seem likely to be useful in some circumstances; and mucuna, which, for various reasons, we are ourselves nowadays inclined rather to despise as a fodder crop, seems to appeal to a few of the more progressive native mixed farmers. But, so far as our experiments have gone, sweet potatoes seem likely to prove the most generally useful crop for feeding; and a thorough study of sweet potatoes as a field crop is now being made. The experiments upon the use of open and closed cattle pens, which were mentioned in last year's report, have led to an unexpected conclusion; which however emphasises the necessity for advice to farmers being based on actual practical tests. In the experiment of this type at Zaria, the quantities of manure made per annum worked out to four tons per annum and two and half tons per annum for the open and closed pens respectively, that is, in the proportion of $3\frac{1}{4}$ to 2. It would at first sight seem that if $3\frac{1}{4}$ tons of manure from an open pen were applied to an acre of crop, and the results compared with those from two tons of roofed-pen manure per acre, then the plots receiving manure from the open pen would be extremely likely to give much heavier yields than the others. The actual result of the experiment is as follows. The yields are expressed as pounds of dried cleaned guinea-corn grain per acre :—

Average yield of seventeen plots unmanured	606
Average increase in yield on eight plots with two tons covered pen manure per acre ...	+430 ± 53
Average increase in yield on eight plots with $3\frac{1}{4}$ tons open pen manure per acre ...	+291 ± 53

At Kano, in an exactly similar experiment, the two kinds of plot gave exactly the same yield, but there the climate is so dry that the roof can have little effect on the physical conditions in the pen, so that little difference is to be expected in the results. Experiments carried out at Zaria indicate that it is better for the cattle to be kept under a roof, though the effect of the different conditions on their

gain or loss of weight was not so great as might perhaps have been expected. Since the labour of carrying extra bedding into the open pen is considerable, it is clear that the farmer at Zaria should be advised to roof his cattle pen. At Kano, roofs are more difficult and expensive to make, and it is of no importance whether the farmer uses a roof or not, so far as we know at present.

41. A final and very careful test was made at Kano of "kraaling", *i.e.*, causing cattle to pass the nights on fields, as against keeping them in a pen. This experiment has been carried out before, but it was felt that the methods previously followed were open to theoretical criticisms in some respects, and the question is of so much importance and interest in connection with mixed farming, that it was deemed desirable to repeat it with every possible care. The results, again expressed in yields of dry guinea-corn grain per acre, were as follows:—

Average yield of nine plots with 400	
cattle nights kraaling per acre ...	1,149 lb.
Average ^{increase in} yield of four plots with 400	
cattle nights farmyard manure per	
acre ...	+ 314 ± 104 ,,
Average ^{decrease in} yield of four plots with 200	
cattle nights farmyard manure per	
acre ...	- 3.5 ± 104 ,,

The result therefore exactly confirms those of similar previous experiments, that the value of a given number of cattle, in the maintenance of fertility of a farm, is exactly doubled if they are kept in a pen on bedding.

42. The high feeding value of guinea-corn leaves has been confirmed, and also the fact that, at all events on reasonably good land, the yield of guinea-corn leaves can be vastly increased by planting the crop closely, without any sacrifice of grain. Indeed, excepting at Daura in the north of Kano Province, where the conditions are peculiar, the more closely planted crops have always given slightly more grain as well as more leaves. By planting the crop at say 30" × 18", the leaves obtained from an acre of a fair crop are more than enough to maintain one adult head of stock in fodder throughout the dry weather; and on good land perhaps 200 lb. more grain per acre is obtained than from the usual wide spacing. Experiments were also carried out in stripping the leaves two or four weeks before harvest time. The results showed that this could be done without the yield of grain being affected at all. But the process is laborious, and it is questionable whether stripped leaves are sufficiently superior in feeding value or palatability to those removed from the stalks after harvest, to make early stripping worth while.

43. As a result of our experiments and trials we are now able confidently to recommend to mixed farmers, at least in the Zaria Emirate, a rotation which will satisfactorily supply all his needs and make the best use possible of the amount of manure the farmer is likely to have.

Repeated weighments at all our farms during several seasons show that the amount of manure made in a roofed pen is usually between $2\frac{1}{4}$ and $2\frac{3}{4}$ tons per head per annum.

The rotation we recommend is as follows:—

- 1st Year : Maize (or millet) and cotton planted through the maize (or millet).
- 2nd Year : Part in groundnuts and part in fodder crops (or all in groundnuts only).
- 3rd Year : Guinea-corn (or millet and guinea-corn mixed).

44. Now repeated experiments at Samaru have shown that, up to a dressing of two tons of manure per acre, guinea-corn gives a return which, at normal prices is more profitable than that from any other kind of crop, and up to this amount the return is practically proportional to the weight of the dressing. Land receiving one ton of manure per acre gives about 250 pounds of cleaned thrashed grain per acre more than unmanured land; while the return from two tons per acre is an increase in yield of about 425 pounds of grain. But, remarkable as it may appear, two tons per acre is the maximum profitable application at Zaria. If it is increased to three or four tons there is little or no further increase in the yield of grain in return for the heavier application. Now a man with a ten acre farm who adopts this rotation will have $3\frac{1}{2}$ acres under guinea-corn, needing up to $6\frac{2}{3}$ tons of manure. If he has no cow, only his two bullocks, then he should have $4\frac{1}{2}$ - $5\frac{1}{2}$ tons of manure per annum. His guinea-corn field needs it all and he has none available for other crops. But the man who has a cow and a calf or two, if he uses as much bedding as he should, ought not to put all the manure onto his guinea-corn crop. He should apply a little to the millet (or maize) in which cotton is to be interplanted. He can expect a return of 200 pounds of grain and forty pounds of seed cotton (over the yield of unmanured land) from a dressing of one ton of manure applied to millet and cotton; or about 300 pounds of grain and sixty pounds of seed cotton from a two ton dressing.

In Zaria it is much better to allow cotton to benefit from manure applied to a previous crop rather than to manure it directly.

Should the farmer have so many cattle that he has still some manure left after giving two tons per acre to both the guinea-corn and the millet and cotton, then the remainder should be applied to the fodder crop, not to the groundnuts. The latter only give a return of a paltry twenty or thirty pounds of decorticated nuts for a ton of manure; and a man with so many cattle will need some fodder crop. It might perhaps be mentioned that on newly broken land, unless it is light land, the rotation should start with cotton or maize and cotton, for millet and guinea-corn do poorly on newly broken heavy land.

45. These practices are now adopted as standard at all the Native Administration centres and demonstration farms in Zaria or on similar soil in other provinces. The great variation in the relative response of the different crops to direct manuring and to the residual effect of manure applied in previous years, make it very much more profitable to grow the crops in the order given and to distribute the manure as described, than to follow any other method. Our three recommendations (a) in favour of the intercropping of maize (or millet) and cotton, (b) against the interplanting of anything in groundnuts, and (c) our relative indifference whether guinea-corn is grown alone or mixed with millet, all are based on knowledge derived from comparative experiments.

46. So much technical detail has been given about this rotation, because it illustrates the value of the experimental farms. It will be realised how different is the position, and how different is likely to be the influence, of an Agricultural Officer or official, who in reply to farmers' questions can give definite concise information such as the above, and one who has to say "I do not know at all", or alternatively give an answer which, being based on assumptions instead of experiments eventually proves to be wrong. The work at experimental farms still remains the foundation of the whole of the department's work in such directions as education and extension. The scope of the experimental work has, in response to financial

pressure, been reduced to but a fraction of what was being done a few years ago; but what is going on now is considered to represent an irreducible minimum, which it is hoped we shall be able to maintain consistently.

BENNISEED EXPORT, EXTENSION WORK.

47. The annual exports of benniseed in recent years have been as in the table below. In compiling this table the seasonal year used is that from July 1st-June 30th, which is the best period to adopt for this purpose. The export of this oil-seed started in 1905 with 126 tons and increased very slowly but, on the whole, steadily to about 1,400 tons per annum just before the war, at which figure it remained steady except for the fluctuations due to varying shipping facilities.

1923-24	...	2,400 tons.
1924-25	...	4,100 ,,
1925-26	...	3,500 ,,
1926-27	...	2,600 ,,
1927-28	...	3,500 ,,
1928-29	...	10,100 ,,
1929-30	...	7,800 ,,
1930-31	...	8,200 ,,
1931-32	...	6,400 ,,
1932-33	...	9,500 ,,
1933-34	...	10,400 ,, (to end of January, 1934).

48. It is impossible to affirm that, but for the operations of this department, none of the recent increase in export would have occurred; but I think everyone with knowledge of the producing area agrees that a large part of the increase since about 1926-27, is directly ascribable to our efforts. Three measures were taken to increase the output. In the first place, the local native method of drying the crop at harvest was soon seen to be very laborious. Experiments showed that that process could satisfactorily, and without loss of crop, be replaced by the much less laborious process of tying the crop in sheaves and stooking them. After thorough trial, this new method was systematically demonstrated first in one district then in another; and last year, in a great part of the Benue Province, every other man was seen to be following the new method. The second measure was early sowing. Two crops of benniseed are possible in the year. But experiments have shown that the late crop, even on land in good heart, and not following early benniseed, yields hardly one-third of what the early crop does. Yet in many districts of the Benue Province, benniseed is invariably sown late, for no ascertainable reason other than "it is the custom". With the assistance of the Administrative Officers and the Native Administrations, campaigns have been conducted—systematically, a certain number of districts at a time—to advertise early planting. This will undoubtedly have results within the next two or three years. For it is not only that increased production is caused directly by early sowing: what is more important is that, when a man plants the early crop and finds how much better return he gets for his labour, he is encouraged to put a larger area under the crop. There is, of course, no objection to a man planting some benniseed late as well as some early if it suits him so to do (This is done in some areas). It is only the limitation of the sowing to the late period which seems so inefficient. The third measure, the elimination of the dark seeded impurities, has been fully dealt with in a previous report. This work continues steadily, and more and more distant areas are "cleared up" each year.

COTTON IN THE SOUTHERN PROVINCES.

49. The purchases for export in recent years have been as follows :—

	NATIVE COTTON.		IMPROVED ISHAN.	
	Bales.	Prices.	Bales.	Prices.
1929-30	3,510	1½d. falling to ½d. (2)	6,026	1½d. falling to ¾d. (1)
1930-31	312	½d. falling to ¾d. (2)	4,289	¾d. falling to ½d. (1)
1931-32	4	¼d. falling to ½d. (3)	1,333	½d. falling to ¾d. (3)
1932-33	4	Not quoted	860	1⅞d. falling to ¾d. (3)

(1) (2) (3). Prices for first, second or third grade respectively according to the grade into which most of the cotton in question was classed.

Cotton growing, especially for export, in the Southern Provinces, reached its nadir last year and is now rising again. By the end of March, 1934, the purchases of improved Ishan for export already exceeded 1,500 bales. The total for the current season is therefore expected to be nearly 3,000 bales. The prices of the different grades of improved Ishan seed cotton are at the moment 1d., ¾d., ½d. for 1st, 2nd and 3rd grade respectively. These are better prices than we have had since 1930 and should encourage greatly increased production next season.

50. *Grading.*—The proportions of the improved Ishan falling into the different grades in 1932-33 were :—four per cent, thirteen per cent and eighty-three per cent respectively, and in the current season to date :—one per cent, six per cent and ninety-three per cent. The standards have been unchanged during these two seasons. Apparently either the middlemen or the producers, or both, consider that the extra money offered for grades 1 and 2 is not enough to make it worth while to try to market any cotton in those grades. The state of affairs cannot be regarded as satisfactory and consideration is again being given to what measures might be taken to improve it.

EXPERIMENTS IN GREEN MANURING.

51. At Ibadan remarkably interesting experimental results have become available during the year, though it was unfortunate that the whole maize crop at Moor Plantation was reduced, by a prolonged drought in April and early May, to only about one-half of a normal yield. This fact does not, however, invalidate the qualitative aspect, at all events, of the results of the experiments, for the differences between the plots were plainly visible before the occurrence of the drought.

The most important points are :—

(a) If a green manure crop, which has been allowed to grow through the dry weather and produce its seed, is subsequently burnt, the effect on the succeeding maize crop is just as good as when the green manure crop is buried green in November before it seeds or dries up.

(b) The " Selected Popondo " bean is actually superior, as a green manure crop to mucuna, which was the best of those hitherto tried. The seed of selected popondo is an excellent butter bean, superior to any other bean that is grown here, while the seed of mucuna is valueless in Southern Nigeria.

52. Now there is no question that the two factors which have caused the native farmer (except perhaps in certain limited parts of the Benue Province) to reject green manuring, have been (a) that they grudged the labour of turning the soil over in order to bury the green manure; (b) it seemed to them to be a far-fetched idea, that one should grow a crop that is otherwise utterly useless, in order to improve another crop that is to be grown the next year. The discovery that, at all events in some conditions the valuable effect of a green manure crop is not diminished by allowing it to mature its seed and then burning it, instead of burying it green before seeding, together with the discovery that the selected popondo is actually more effective in improving the soil than mucuna, radically alters the prospect for extension work in green manuring.

NATIVE ADMINISTRATION FARM CENTRE, ABEOKUTA.

53. Largely in order to demonstrate these new ideas about green manuring, but partly for more general purposes, a small Native Administration farm centre has been started at Abeokuta, financed by the Native Administration, but directed by us. So far there is every promise of a successful future for this venture. This is the first, but we hope not the last, of such farms in the Southern Provinces: and the enterprising action of this Native Administration is highly appreciated. The work on green manuring and liming in the Eastern Provinces has been continued. This year's experience suggests that it is in the growing of *Tephrosia candida* (or possibly some other species of *Tephrosia*) that lie our best hopes of improving these poor acid soils. The present moment is, however, an inopportune one for reporting on this work, for so much depends on the success of certain test crops which have just been sown.

54. CO-OPERATIVE SALE OF FERMENTED COCOA.

	Oyo Province.	Ondo Province.	Cameroons.	Ijebu Province.	Totals or Average.
Total number of active members of societies:—					
1931-32 ...	337	511	862	...	1,710
1932-33 ...	616	682	1,100	150	2,548
1933-34 ...	1,859	995	1,833	190	4,877
Total quantity of cocoa sold, tons:—					
1931-32 ...	315	253	158	...	724
1932-33 ...	471	501	250	67	1,289
1933-34 ...	747	446	367	48	1,608
Quantities per mem- ber, tons:—					
1931-32 ...	·93	·50	·17	...	·42
1932-33 ...	·76	·74	·22	·44	·50
1933-34 ..	·40	·44	·20	·25	·33
Proportion of grade I cocoa, per cent.:—					
1931-32 ...	88	97	...	...	...
1932-33 ...	97	98	...	90	...
1933-34 ...	96	99	89	99	...

CO-OPERATIVE SALE OF FERMENTED COCOA—*continued.*

	Oyo Province.	Ondo Province.	Cameroons.	Ijebu Province.	Totals or Average.
Total cash received:—	£	£	£	£	£
1931-32 ...	5,286	4,477	2,707	...	12,370
1932-33 ...	8,188	8,610	4,250	1,229	20,277
1933-34 ...	9,076	4,985	4,455	597	19,063
Average price per ton:—	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1931-32 ...	16 17 0	17 14 0	17 5 0	...	17 1 9
1932-33 ...	17 18 5	17 4 10	17 7 3	18 6 10	15 14 7
1933-34 ...	12 2 0	11 3 9	12 2 9	12 18 9	11 17 2
Average premium per ton over F.A.Q.:—					
1931-32 ...	2 9 6	2 9 6	3 0 0	...	...
1932-33 ...	3 0 11	2 13 10	4 0 0	2 4 3	...
1933-34 ...	2 9 5	2 15 2	3 0 0	2 6 9	...
Average cost of Marketing per ton incurred by societies:—					
1931-32 ...	0 7 4	0 5 9	...	...	...
1932-33 ...	0 7 10	0 4 5	...	...	...
1933-34 ...	*0 10 1	0 7 3	...	0 3 4	...
Total reserves of societies:—	£	£			£
1931-32 ...	192	120	...	...	312
1932-33 ...	280	165	...	...	445
1933-34 ...	372	205	...	...	577

* Ilesha F.A. only.

These figures tell most of the story. The outstanding advance during the year has been in the Ibadan Division of the Oyo Province. The history of our efforts in this district forms an instructive commentary on co-operative work. When we took up the matter of cocoa fermenting twelve years ago, the natural place to start was at Ibadan. But we found ourselves up against what amounted to a counter campaign conducted by the Ibadan Farmers' Association by the means that are usual in such circumstances—never ending delays, repeated evasions, broken promises. The villages seemed to be ready enough to start co-operative fermenting and sale, but meekly maintained that they, as members of the Ibadan Farmers' Association, must await the instructions or advice of the influential men—the hereditary leaders—in the central association. Now the Ibadan Farmers' Association was primarily a council of the influential townsmen, native traders and middlemen, and the village representatives functioned chiefly as listeners. True, some of the trader members also have farms, and doubtless the trading and farming members often had interests in common, for which they could work together. But, equally naturally, the middlemen were far indeed from being enthusiastic supporters of co-operative sale, or anything else which helps the producer of good produce to get the proper value of it. Thus, for twelve years, our efforts, repeatedly renewed, as repeatedly met a blank wall of apathy and passive resistance. At last the pressure of the economic interest, in hard times, proved too much for old loyalties and one group of villages informed us of their desire to break away from the central association and to form their own village societies. They were quickly followed

by others, and the parent body, finding itself deserted by its rank and file, wisely decided to dissolve itself. Altogether twenty-two village societies have been formed so far with a total of 1,237 members, who sold 399 tons of cocoa through the societies. The Superintendent of Agriculture of course helped a good deal in the arrangement of sales and payments, as we always do for new societies; and some of the societies were given the services of temporary departmental assistants as clerks for the first half of the season only. There is now every promise of very successful work in this area—a matter of great satisfaction to us. For our failure in this matter in the past had robbed us of a most valuable means of making friends with the farmers of the district. Also it has resulted in Ibadan producing much less Grade I cocoa than any other area, except Ijebu-ode.

55. Much progress has been made in all areas towards getting each society on to a self-supporting basis financially, and, except perhaps in the Cameroons where the difficulties are exceptional, the position in this respect is already, or very soon will be, entirely satisfactory. Progress is slower in the direction of making the societies self-managing, except for such general direction and occasional supervision as might be given by a co-operative registrar's department or the officers of a co-operative union. However, even in this direction, some progress is made each year. Thus, for instance, in Ondo in 1931-32, all payments to farmers, that is the sharing out of the proceeds of sales, were made by the Superintendent of Agriculture or his assistant: in 1932-33 four-fifth of the payments were made in this way, and one-fifth of the whole was self-managed by the committees of the best societies; in 1933-34 the Superintendent of Agriculture or the assistant superintended the payment of only one-fifth of the total amount of money paid out. There were one or two unfortunate incidents, due to committees disregarding our plain advice about obvious precautions and safeguards. But, no great harm was done and healthy lessons were learnt and taken to heart.

OIL PALM PLANTING.

56. The year's progress in the making of small oil palm plantations is shown by the figures in the table below. Full details of the annual progress from 1928 to 1932 were given in last year's reports.

				1932.		1933.	
				Total No. of Farmers to date.	Acreage.	Total No. of Farmers to date.	Acreage.
Benin ...	...	..	...	117	310	156	4741 $\frac{1}{2}$
Warri ...	...	...	...	16	16 $\frac{1}{4}$	19	51 $\frac{3}{4}$
Owerri ...	...	...	...	21	119 $\frac{1}{2}$	72	160
Calabar ...	...	...	...	36	113	71	138
Onitsha ...	...	...	...	7	36 $\frac{1}{2}$	35	111
Abeokuta ...	...	...	...	3	4	3	4
Ogoja ...	...	...	...	...	..	1	1
Total ...	...	...	...	200	629 $\frac{1}{4}$	357	940

57. A study of the figures conveys all that it would be necessary for me to say about last year's steady progress. There is every appearance, in the form of requests for assistance, that

progress will be accelerated in 1934, and recently more active propaganda and publicity has been arranged which may be expected to show its effect in 1935.

PALM GROVE IMPROVEMENT.

58. The results of the palm grove experiments which have been printed in this report annually for several years are not given this year as they have served their purpose. Progress in the extension of grove improvement has been much slower than the making of new plantations, doubtless owing to the lesser difficulties in connection with the tenure of the latter. Departmentally, it is of course a matter of indifference which process is adopted, indeed the difference between the two processes is often only one of degree. The figures are as follows :—

PALM GROVE REPLACEMENT (NATIVE OWNED).

	1932.		1933.	
	No. of Farmers to date.	Acreage.	No. of Farmers to date.	Acreage.
Benin	10	31 $\frac{1}{4}$	13	39 $\frac{3}{4}$
Owerri	2	7	2	7
Calabar	6	23 $\frac{1}{2}$	8	24 $\frac{3}{4}$
Ogoja	—	—	1	2
Total	18	61 $\frac{3}{4}$	24	73 $\frac{1}{2}$

PALM OIL PRESSES.

59. Demonstration of these presses continues steadily, financed in some places by the Native Administrations in others by the Department. Thirteen large and three small Duchscher presses were sold during the year and the total number of presses in the country (excluding of course stocks in sellers' hands) on 31st March, 1934, was as follows :—

OIL PALM PRESSES.

			DUCHSCHER PRESSES.				CULLEY, ETC., PRESSES.	ALL KINDS OF PRESSES.		
			SALES.		DEMONSTRATION.					
			Large.	Small.	Large.	Small.	Sales.	Total.		
Abeokuta	...	...	...	...	1	...	...	1		
Benin...	...	...	...	...	1	...	9	10		
Calabar	...	...	8	3	...	...	10*	21		
Colony	...	...	...	...	1	...	...	1		
Ondo ...	...	...	...	...	1	...	...	1		
Onitsha	...	...	10	3	4	1	19	37		
Owerri	...	..	7	3	2	...	2	14		
Oyo ...	...	...	2	1	1	1	1	6		
Warri	...	...	...	...	1	...	...	1		
Total ...			...	...	27	10	12	2	41	92

* Approximate : requires verification : probably actual number is greater.

Demonstration presses are chiefly those belonging to the Agricultural Department but include a few belonging to Native Administrations.

KOLA PRODUCTION.

60. It is possible to calculate from figures kindly supplied by the Customs and Railway Departments, a figure approximating to the total weight of kola nuts which are produced in the Colony and Abeokuta and railed to the Northern Provinces. The preparation of the table involves the making of some assumptions; but the figures are undoubtedly substantially correct:—

Year.	Imports—Customs figures—tons.	Railings of Nuts believed to be of local origin tons.	Totals tons.
1928	6,350	3,741	10,091
1929	4,531	6,321	10,852
1930	4,774	6,869	11,643
1931	1,679	9,961	11,640
1932	1,260	10,740	12,000
1933	875	11,137	12,012

The locally grown nut has killed the trade from the Gold Coast entirely, and has almost entirely replaced the Sierra Leone nut too, in spite of the very high reputation which the latter enjoys in Nigeria.

61. Although the consumption has grown, even during the depression, yet it is clearly a question whether the local production alone will not soon be in excess of the demand. In considering this subject, it should be realised that every expansion of trade and of communications in the Northern Provinces, every increase in the habit of travelling among the ordinary people there, brings a definite increase in the kola trade. A considerable extension of the use of motor lorries in the Northern Provinces, for instances, would have a great effect on the sale of kolas. For, being a perishable article, kola would especially benefit from any extension of rapid transport.

62. Buying kolas, whether in Agege or Sierra Leone, and selling them in Kano is a trade that is full of pitfalls for the unwary. Success depends not only on wise selection and good bargaining when the nuts are bought; but also on tending and picking them over frequently until they are sold in Kano. An error of judgment, or a little carelessness, can easily result in a heavy loss in the shape of spoilt or weevilled nuts. For this reason, the Syrian merchants and their Hausa buyers are certainly entitled to establish a margin of handsome width between their buying price at Agege and their selling price at Kano. It is equally certain that they take advantage of these peculiar conditions to form a ring and to keep that margin even wider than it need be.

63. But the Nigerian producer plays into the hands of the ring, and spoils his own trade, by selling his nuts before they have been prepared for storage, with the natural result that at harvest time the market is glutted with fresh local nuts which have to be sold very cheaply; while, during the remainder of the year, stored kolas are still imported from Sierra Leone. Stored kolas are apparently always markedly superior in flavour to fresh nuts. The treatment of kolas that are going to be stored is not really very laborious, but it is rather tediously long and complicated; and the keeping quality of the nuts is very greatly affected by the judgment that is exercised in the first and last stages of the preparatory treatment—*i.e.*, in the fermenting before skinning and in the wilting process. These preparatory processes take three or four weeks; and even then the nuts still need to be examined daily for another week or so. After

six weeks they are liable to little further deterioration, and can then be stored in leaf-lined baskets even until the next harvest time, with no further loss, nor trouble beyond the changing of the leaves when, after a month or so, they are beginning to get too dry. It may thus be said that for the first few weeks kola nuts are a perishable article needing skilled treatment and constant care. Thereafter they become comparatively imperishable. All this, of course, refers to storage in the humid climate of Southern Nigeria. More difficulty is experienced in the north in keeping them from becoming too dry after a few weeks, especially as suitable leaves are not available there.

64. It is clear that if the Nigerian producer is to command a good price for his kolas he should at least prepare them for storage, even if he does not actually store them. Each grower has only a relative small quantity to prepare and neither space, labour nor care should cost him money. The trader has to pay for both space and labour, and moreover naturally takes that advantage which the buyer of a perishable article always has over the seller.

65. It seems hardly credible that the failure of the Agege farmers to store their kola for gradual sale throughout the year, should be due merely to ignorance of the proper method of treatment, such as is adopted by the Syrian buyers and their Hausa agents. Yet a demonstration of the correct, "Sierra Leone" method, by the Superintendent of Agriculture, Agege, attracted the greatest interest among both growers and buyers. The latter stated that the Nigerian nuts thus prepared, were fully equal to the best imported from Sierra Leone. There would seem to be an opportunity for a co-operative society or societies, which would deal in properly prepared and reliable kola, and sell it to, or through, a reliable firm with agents in Kano. The amount of attention which this department can afford to devote to the matter is very limited, especially in the absence of a local Native Administration in the Colony, which might give some financial assistance. The most we can hope to do is a little preliminary work, which may prepare the ground for more intensive work by the Registrar of co-operative societies when he is appointed.

WHITE KOLA.

66. The white kola nut is so much more highly esteemed in Nigeria than the dark red type that it fetches about twice the price; while even the intermediate shades fetch intermediate prices in inverse relation to the depth of colour. The white kola is milder in flavour and there seems some ground for believing that its higher value is not merely due to its rarity. When, therefore, the botanical section were able to start studying this crop a couple of years ago, one of their first studies was that of the factors which govern the occurrence of white nuts. There was on Moor Plantation already a small isolated plot of kola trees grown from white nuts. In three harvestings without any special precautions these trees yielded nuts as follows :—

1931	...	...	485 white.	183 coloured.
1932	...	...	309 „	48 „
1933	...	...	309 „	33 „

In 1933 a number of flowers were self-pollinated. They yielded 582 white nuts and no coloured nut at all. Therefore, it appears that the white colour is a simple recessive character; but that, in spite of that fact, coloured nuts can arise on trees grown from white nuts, as a direct result of out-pollination, by the rather unusual phenomenon

of xenia. If this theory is correct, it will not be difficult to produce plots of kola which will yield only white nuts, and to teach the native farmer how to do the same.

EXPORT OF PINEAPPLES.

67. The season 1933-34, like the previous one (*see* paragraph 79 of last year's report), was devoted entirely to experimental work, aiming at an improvement of the quality of the pineapples as landed in Liverpool, and no serious attempt was made to increase the quantity. The exports each season have been as follows :—

1931-32	...	...	574 cases containing	2,161 fruits.
1932-33	...	...	172 „ „	1,260 „ „
1933-34	...	...	494 „ „	2,764 „ „

68. In 1931-32 and 1932-33 the sizes of fruit exported varied greatly. But it is now clear that for profitable export fruit should not exceed six pounds in weight and the most desirable size is that weighing between two and three pounds, of which twelve fruits can be packed in the standard large case. At present such small fruits are rare, and in 1933-34 fruits up to six pounds were exported : and the average number per large case works out to 9.1

69. In 1931-32 the bulk of the fruit was exported to the United Kingdom by the Agricultural Department on Government account or for private individuals. Most of that of 1932-33 was sent to the United Kingdom by a British exporting firm. In 1933-34 shipments were sent as follows :—

To United Kingdom.

By private individuals	...	1 shipment of 97 fruit in all.
By exporting firms	...	5 shipments totalling 1,404 fruit in all.

To the Continent.

By exporting firms	...	5 shipments totalling 1,263 fruit in all.
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The firm exporting to the United Kingdom aimed at a regular shipment of forty large cases by each sailing of the mail steamer. The report about the first consignment indicates that the fruit arrived in a much more satisfactory condition than ever before, and only one fruit in twenty-three cases was unsaleable. But in the later shipments apparently many fruit were overripe or bad; and though full details have not been received it is feared that most of the fruit in several consignments were unsaleable.

70. The procedure at present is as follows :—The fruit is bought by the firm at Sango Otta at a store hired by them for the purpose. Buying takes place only on Wednesday and Thursday of each week. The buyer for the English firm is a farmer of the district and was specially trained by the Agricultural Department before he took employment with the firm. The fruit is packed on the day after purchase. At present the Superintendent of Agriculture, Agege, goes to the store every packing day to inspect the fruit in accordance with the regulations governing export. The sealing of the cut ends of the stalks of the fruit and the packing takes place at the shed and ordinarily the cases are not opened again before export. They are taken to the Cold Store at Lagos by lorry as soon as they are packed, and the temperature is reduced to 60°F. the first day, then kept at 50°F.

71. This comparatively simple treatment has been reached after a considerable series of experiments in which much more

elaborate systems were tried. The comparatively satisfactory result of this season's first shipment leaves little doubt that this method is satisfactory.

72. Moreover, the reports indicate (though again we still await full details) that even in the later shipments the fruit from the experimental farm at Agege was very much more satisfactory than the remainder. Now everyone of the native-produced "wild" fruits in each consignment was most carefully selected for exact uniformity of condition and ripeness. The selection was as well done as it is possible to do it by appearance. It must therefore be accepted that the smooth cayenne pineapple grown by the native farmer as he grows it at present—that is anyhow, "wild"—is not suitable for export. But it is still unproven whether or no this pineapple or some other when properly cultivated can be exported from Nigeria profitably with the existing shipping facilities (of course, weekly ships taking ten days instead of fourteen days would put the whole matter on a different basis altogether). It is, however, still evidently worth while for the Department to continue its experimental work in this direction until a definite conclusion is reached.

73. The buyers, by the advice of this Department, have paid the growers threepence per pineapple. The cost is roughly doubled by the time the fruit is packed and on the ship; and by the time the fruit is landed again, it has risen very near indeed to one shilling per fruit. These figures all refer to the small pineapple of two to three pounds weight: they are based on the experience of the small consignments sent by the Department and handled for us by agents. A firm handling the trade commercially might reduce the expenses by a penny or two. It is safe to assume that good fruit of the two to three pounds size, in perfect condition, will be sold in the retail shops at prices between two and three shillings each. It will be evident that if all the fruit reached England in good condition, there would be a margin of profit for the merchant and the retailer. But it is also evident that if, as has occurred each year so far, a considerable part of several consignments is valueless, the result of the season's work will be a loss. If there is to be a real commercial export the average wastage ought not to exceed one per cent or so. For, quite apart from the actual loss, no fruit merchant or retailer will willingly handle unreliable fruit at any price.

74. It is clear that at least some of the important deleterious factors are to be found in the differences between the way in which pineapples are grown by native farmers and by ourselves. The pineapples grown by native farmers vary in strain, in whether they are grown in the shade or in the open, whether they are crowded or widely spaced. Our next step is to test the effect of each of these, and some other variable factors, on the keeping quality of the fruit. It is likely that no one will wish to ship commercially next year. If so, shipments will be restricted to a small number of cases per fortnight sent departmentally, and to fruit grown on our farm, or on the farms of the very few native farmers who have planted pineapples according to departmental instructions and continue to cultivate them in that way. Every effort will be made to accelerate the experimental field work.

75. It might be thought that we could solve our problems by following the methods of other countries. But this is not the case. For instance on the question of shade or no shade, we have been told by different persons with practical experience of other pineapple growing countries (a) that in Nigerian conditions shade would be essential; (b) that in Nigeria shade would be a fatal mistake. The

only thing to do is to find out the truth by comparative experiments. It is too early to predict a successful outcome from the experimental work; but it can be said that there is still ample justification for hoping for such, and therefore for continuing the work.

76. I should like to take this opportunity of recording the fact that this work on pineapple export could not have been carried out as it has been done, had we not received a quite remarkable degree of co-operation and assistance from the Cold Storage Company and the Shipping Company. Both firms, at considerable expense, especially in the case of the shipping firm, installed for this purpose special chambers which are cooled by circulated air instead of by internal pipes. Both also have shown full sympathy with our experiments,—experiments which must sometimes seem to practical men, petty, slow, and unduly cautious.

EXPORT OF ORANGES.

77. Small shipments of ordinary Nigerian oranges were made for the second season in succession. At present the oranges are sold rather cheaply in Liverpool at a price which only leaves a very small profit after paying all expenses. The operations are carried out by a syndicate under the direction of the Superintendent of Agriculture. It is clear that there can be no very considerable trade until many more oranges have been planted and come into bearing. However, the demand will also take time to grow. At present the subject appears a promising one, provided the present standard of selection and packing of fruit can be maintained, or preferably improved, when the trade is on a larger scale.

PRODUCE INSPECTION.

78. On the whole, the work of the Produce Inspection branch may be said to have been carried on efficiently and satisfactorily as usual. It will be remembered that, in order to bring the cost of the scheme within the funds collected in the form of inspection fees, the staff of European Inspectors has been halved since 1931. Hitherto I have been able to write with optimism of the prospects of fully maintaining, in spite of this reduction, the very high standard of general efficiency which had been set up when the staff was bigger. I regret to state, however, that, while the efficiency during the past year can, I think, fairly be described as “satisfactory”, yet it is reported by both Superintending Inspectors of Produce that there was a distinct falling off in the general level of the work of the examiners, as compared with that in previous years. The reason undoubtedly was that the visits paid by the Inspectors of Produce to their out-stations were not frequent enough. It is hoped that the provision that has been made for more travelling by each officer next year will put this matter right, in spite of the number of officers remaining at its present minimal figure.

COCOA GRADING.

79. Another subject about which only a disappointing report can be made, is the improvement of the quality of cocoa. There is no ground at all for any complaint on the score of defective beans, but only in regard to that of the degree of fermentation. The proportion of cocoa which passed in the first grade has not increased for the first time since 1930, when the standard became a practical one and the same as it is to-day. The actual figures referring only to main crop cocoa graded between 1st October and 31st March in the Western Provinces in each year, are as follows :—

GRADE I.

			Tons.	Percentage of whole crop.
1930-31	...	...	3,700	8.5
1931-32	...	...	5,600	13.0
1932-33	...	...	7,700*	18.0
1933-34	...	...	6,500	16.4

* *Note.*—Erroneously printed as 9,700 in last year's report.

Both in actual quantity and proportion, the amount of grade I cocoa has decreased as compared to last year. It may, perhaps be argued that the right attitude should be satisfaction that the general depression has not caused a greater reduction than it has. But it is very disappointing to me and to my officers.

80. To appreciate what these figures mean, it must be realised that neither the 7,700 tons in 1932-33 nor 6,500 tons in 1933-34, represents the whole, or anywhere near the whole, of all the small lots of grade I cocoa originally produced by farmers. What the figures represent is not this, but only that fraction of all the small lots of first grade cocoa which the middlemen have troubled to keep separate in making up the larger parcels which they present for grading. Presumably, therefore, the reduction in the amount of grade I cocoa is due to the reduction of the premium for this cocoa over F.A.Q. (grade II) to fifteen shillings instead of £1 as it was last year. The starting of the village cocoa sale societies in the Ibadan area, hitherto one of the most backward as regards sale of fermented cocoa, may have an effect in this respect next year.

81. One or two firms have complained that the proportion of fermented beans in the grade II (F.A.Q.) cocoa has declined since last season. Our statistics show that the statement is undoubtedly true; but there seems no cause for regret or complaint on this account. At the beginning of last season the limit of unfermented beans permitted in grade II was raised to 100 per cent. It will not be surprising if eventually the average proportion in grade II approaches this figure. The change in the standard demanded was made at the suggestion of the trade. It was affirmed by the spokesmen of the trade that the degree of fermentation of any cocoa was of no importance to a buyer, unless the sample was up to G.F. standard (*i.e.*, grade I). In these circumstances there would seem to be no cause to regret the deterioration of grade II as regards content of fermented beans. All agree that there has been no deterioration or ground for complaint in respect of defective beans.

O. T. FAULKNER,
Director of Agriculture.

MOOR PLANTATION,
IBADAN,
15th June, 1934.

